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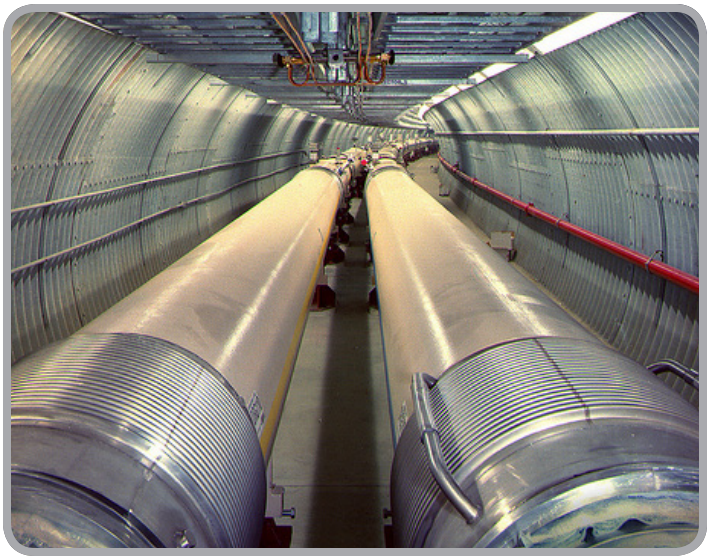
Volume II, Issue 7
July 2012

Brookhaven's RHIC Sets Record



Brookhaven recently learned that Guinness World Records has recognized our 2.4-mile particle accelerator, the Relativistic Heavy Ion Collider (RHIC), for generating a record temperature of 7.2 trillion degrees — about 250,000 times hotter than the center of the sun.

The temperature, achieved for fractions of a second on a microscopic scale, occurs when gold nuclei collide after circulating around the RHIC ring at near light-speed. The energy released is so intense it melts the neutrons and protons inside the gold nuclei into quarks and gluons, forming a nearly friction-free particle soup called quark-gluon plasma. RHIC physicists measured the temperature of the ultra-hot matter, which is thought to have filled the universe just after the Big Bang, back in 2010. Guinness took notice and sent the "hot" news circulating around the world again this summer.

RHIC may not hold onto its record for generating the highest man-made temperature for long, however. The Large Hadron Collider (LHC) at the CERN laboratory in Europe smashes lead ions together at even higher energy. But scientists there haven't published a temperature measurement – yet.

Of Discovery, Innovation, and Epic Projects

Much of what we know about the basic building blocks of matter and about nature's fundamental forces has been learned from research using beams from particle accelerators. These essential tools of modern science and technology also have many practical applications.

Accelerators produce short-lived radioisotopes that are used in over 10 million diagnostic medical procedures and 100 million laboratory tests every year. Ion beams from accelerators add special atoms to semiconductors and other materials. Ion implantation is used to produce hard surface layers in artificial hip and knee joints, high-speed bearings, and cutting tools. Accelerators are also used for dating archeological samples and art objects, for pharmaceutical research, and to unravel the structures of DNA and proteins.

RHIC is currently our only circular colliding beam accelerator, where two beams circulate in opposite directions and come into collision for physics research. Other circular accelerators such as the National Synchrotron Light Source (NSLS), NSLS-II, the Alternating Gradient Synchrotron and its Booster, circulate particles around a ring many times and send streams of particles down paths called beamlines for many types of research. The LINAC and Tandem Van de Graaf are linear accelerators, where the beam passes through the accelerating fields and magnetic focusing fields only once. Our Medical Department has also used accelerators and at one time had three in operation that were used for the production of radiopharmaceuticals.

Accelerators have played and continue to play a major role in much of the research here at Brookhaven, dating from the time the Cosmotron began operation in 1953. It was no surprise that Popular Science named RHIC, our largest accelerator, one of the Universe's Ten Most Epic Projects last year.

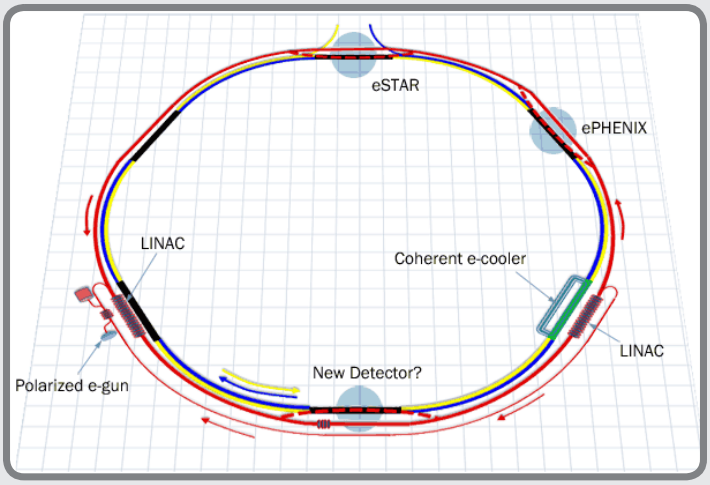
(Contributing source: The American Physical Society's publication "Accelerators and Beams Tools of Discovery and Innovation".)

Trailblazing a Path to the Future

Brookhaven operates at the forefront of nuclear physics research in the United States in large part because of RHIC, which recreates the conditions of the early universe. The National Research Council (NRC), the principal operating agency of the National Academy of Sciences and the National Academy of Engineering, recently included RHIC in its report detailing the significant advances in nuclear physics over the past 10 years.

According to the report, RHIC is central to the last decade's experimental milestones and future innovations. The report also offered critical recommendations for a competitive, trailblazing future. In addition to noting continued development of research projects throughout the country, the Council cited RHIC as a candidate for a proposed electron-ion collider, as well as on-going work at Brookhaven to develop the next generation of accelerators for precise, safe cancer therapy.

There are compelling reasons to build an electron-ion collider at Brookhaven, which calls for the addition of a 5 to 10 billion-electron-volt electron accelerator ring inside the existing RHIC tunnel. These include the Lab's rich physics history, accelerator expertise, and the existence of a fully functional and productive proton/heavy-ion accelerator/collider (RHIC) and its international collaborations of physicists eager to continue their explorations of matter to offer insight into the fundamental structure of our world.



Fuel Cell Research Wins R&D 100 Award

A Brookhaven research team recently received a 2012 R&D 100 Award from R&D Magazine for their work designing durable electrocatalysts for use in fuel cells. Their work could make future fuel cell vehicles more reliable and economical.

Since 1963, the R&D 100 Awards have identified revolutionary technologies newly introduced to the market. They span industry, academia, and government-sponsored research.

Brookhaven scientists have previously won R&D 100 Awards for imaging techniques, cancer detection, and microscopes for nanomaterials.

Energy Secretary Steven Chu congratulated the winners and said, "The research and development at the Department of Energy's laboratories continues to help the nation meet our energy challenges, strengthen our national security, and improve our economic competitiveness."

Happenings

- **August 5 –**
Our last Summer Sunday – visit RHIC, our Guinness World Record holder, 10 AM to 3 PM. Free.

*The events above are free and open to the public. Visitors 16 and over must bring a photo ID for access to BNL events.

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